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THE IMPLICIT CONTRACT MODEL AND LABOR MARKETS: A CRITIQUE

by

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Errata

Pages 4-6 in the text should be replaced by the following pages, 4-6b.

Introduction

The theory of implicit labor contracts (Baily 1974 and 1977, Gordon 1974, Azariadis 1975) was offered to explain a puzzling empirical phenomena. Firms adjust to varying economic environments primarily by adjusting the size of the used labor force and correspondingly the quantities produced) rather than by adjusting the wage of employees (and the prices of the goods sold). In a bad economic environment (from the firm's point of view) a firm typically laysoff and/or fires employees who thus become involuntarily unemployed in the following sense. Those unemployed prefer to change positions with their equals who were not laid off. Those who are working are not willing to engage in this swap.

Other related stylized facts are the following. Laidoff individuals are not compenstated by the firm. They are partially compensated by a central authority which administers the unemplopyment compensation, the firm has the freedom to decide when and how many employees to layoff. There exist explicit contracts which specify higher wages for overtime work. To the list of these micro level facts the following macro level stylized fact is added (Herschel Grossman (1981)): There exists a positive association between the level of aggregate employment and the prices firms charge their customers even though the price change may represent a pure inflation (with no change in relative wage).

The Keynesian's sticky wage argument explains the observed phenomena of variation of employment and the spells of unemployment by some employees but shifts the puzzle one step backward. We now have to explain why wages are sticky so that involuntary unemployment (and reduced output) results. Some recent neoKeynesian microeconomic attempts to explain unemployment in disequilibrium models are summarized in a survey article by Drazen (1980). A recent Robertsonian-Keynesian macro model is presented by Kohn (1981).

A thoroughly different and innovative approach (to explain the sticky wage and the variable employment) is the theory of implicit labor contract. The driving force is the idea that the employer and the employee implicitly contract to coinsure against uncertainty over the complete range of random environments. This coinsurance supplements the usual transfer of the labor services for the agreed upon wage.

The classical constraint that the firm, in maximizing its expected utility of profit, has to pay the employee the going market wage (which is determined in competitive spot labor markets) is replaced by the constraint that the firm guarantees the employee a reservation expected utility. The reservation expected utility (rather than the going wage) is determined in competitive labor markets. The solution to this maximization problem is then a point on the expected utility frontier of the two parties.

Unfortunately the implicit contract model cannot explain the stylized facts it was set to explain. A few alternative versions of the basic model were offered. Some of them in order to eliminate contradictions between the empirical implications of earlier versions and the stylized facts. In this sequel, successful eliminations of some contradictions were attained by generating some others.

In the next section a few variants of the implicit contract model are described, some of their specific assumptions criticized and the implications of their relaxation are pointed to. The empirical implications are juxtaposed next to the stylized facts to reveal inconsistancies.

A critical discussion of some of the more general behavioral assumptions which are made in these models follows in the third section. The fourth section offers a conclusion.

II Implicit contract models and the stylized facts

(1) Symmetric information models with risk neutral employers

In its abstract form the implicit contract theory deals with an atemporal gamble that the two sides (employer and employee) are locked into once they match (that is the match remains binding for all possible states of nature and no expost mobility is possible). When both sides possess identical (symmetric) information regarding the actual realization of the state of nature the implicit contract involves an agreement on two schedules, $l(s)$ and $w(s)$, where s is the state of nature, $l(s)$ the amount of work transferred from the employee to the employer and $w(s)$ is the wage that the employer pays the employee. These schedules are obtained as a solution to the program that maximizes the employer's expected utility of profits subject to a guaranteed level of expected utility to the employee.

If the employee is endowed with a unit of labor and if the opportunity cost of the unit labor is zero (i.e. there is no alternative use of the unit labor at home; not even as additional leisure), then all of it will be used in any state of nature provided its marginal productivity exceeds zero (in any state of nature). (See apendix).

(1a) Rigid Wages

To obtain a rigid, (i.e. state invariant) wage in the contractual model under these assumptions it is necessary and sufficient that the firm be risk neutral whereas the worker be risk averse. Indeed, a risk neutral firm's goal is to maximize expected profit which (given the amount of labor - a unit labor) necessitates minimizing the expected wage bill subject to the guaranteed level of expected utility for the employee. The strict concavity of the employee's utility function then implies that the wage should be a constant such that $U(w^*) = K$, where U denotes the utility, K is the reservation expected utility level and w^* is the state invariant wage. Any

other schedule $w(s)$ such that $E(w(s)) < w^*$ will generate an expected utility which falls short of K since:

$$(1) \quad EU(w(s)) = U(Ew(s)-\alpha) < U(w^*)$$

where E is the expectation operator. The inequality follows since α is positive because of the concavity of U and $Ew(s) < w^*$ by assumption. Note, however, (see the previous paragraph) that not only is the wage state invariant but under the assumptions made thus far, also the employement level is. In particular, there are no layoffs (Akerlof and Miyazaki (1980), Polemarchacis (1979).

(iii) Rigid Wages and Involuntary Unemployment

Involuntary layoffs (in some bad states of nature) coupled with state invariant wage in states of employment can be generated by the implicit contract model if in addition to the assumptions made thus far we add the following: the supply (or demand) of the unit labor is an all or nothing function; the unit labor has a known intrinsic value (the opportunity cost of leisure or work at home); in layoff states the firm does not compensate the employee (the employee is partially compensated by the central unemployment compensation authority).This is the model investigated by Azariadis (1975)

The contract model, under these assumptions, generates an invariant wage in states of employment for the reasons discussed in the previous sub-section. It generates involuntary layoffs (involuntary unemployment) for all states of nature in which the valuated product of the unit labor falls short of the opportunity cost (for the employee) of this unit time. The intuition of this result is straight forward. The joint expost value of a match employer-employee (dis-regarding its distribution) is either the valuated productivity of the unit labor (if the unit labor is used at work), or its opportunity cost (if it is not used in work). Therefore, states (of nature)

for which the valuated productivity of the unit labor falls short of its opportunity cost the match (employer-employee) will realize a higher joint value if the unit labor will be put to rest. If under the above assumptions the firm contracts a pool of employees, then the percentage of those actually employed is determined by the condition that the unit labor employed at the margin has a valuated productivity which exceeds or is equal to the opportunity cost of a typical employee's unit time whereas the valuated product of the next unit of labor falls short of it. The laid off employees (who are not being compensated by the firm) clearly envy their equals who are lucky to retain their jobs. Hence, the unemployment is involuntary.

The involuntary unemployment and the rigid wage are the empirical implications which the model was set to explain and thus the model is consistent with the evidence.

However the unemployment in the implicit contract model described above is involuntary by assumption rather then being deduced from the contract model. Azariadis assumes a zero wage (and only a partial social unemployment compensation) in states of unemployment. This assumption is not justified by any a priori economic (or institutional) reasoning, since no one forces the firm not to pay its employees at any particular state of nature. Indeed the wage payed to laid off individuals is part of the contract the firm offers its employee) and thus its value (and indeed the complete schedule $w(s)$ should be chosen so that expected profit is maximized. Given that the firm has to offer a contract that satisfies the reservation expected utility of the employee and in view of the strict concavity of the employee's utility an argument similar to the one which leads to equation (1) implies that the firm's expected profit is maximized by equating the utility level of each employee across states of nature including states of layoff. Thus the wage payed by the firm to a laid

off employee should equal the wage payed an employed individual less his opportunity cost of time and the unemployment compensation. This wage is in general positive. Why then should the firm impose (by its own decision) a zero wage in layoff states if by providing a positive wage its profit increases? This correct criticism (of the imposition of zero wage for laid off individuals) is raised in Akerlof and Miyazaki (1980) and Azariadis (1979). Clearly the constraint of zero wage payed the laid off employees is logically unacceptable and should be eliminated

Without the zero wage constraint (for laid off employees) the model still generates variation in employment due to the positive intrinsic value of time (as explained above) but the laid off employees are as happy as they would have been if they would not have been laid off, moreover they are as happy as the employees that were not laid off. Consequently the implicit contract model described above does not generate involuntary unemployment and thus cannot explain its existence.

The assumption that the employee has a unit labor which is either used at work in its entirety or is not used (at work) at all is not logically flawed. It may be justified, at least partially, on institutional arrangements and on set up costs. Yet it is overly restrictive. If we relax this assumption and allow the employees utility function to depend continuously on a composite good (income) and on leisure with the plausible specification that both are normal goods, the wage rigidity disappears and both the employment level and the wage vary with the state of nature.

To show this let the valuated production function be a product of the random variable, s, (which may represent the going market price for the firm's product) and a deterministic concave function in labor $g(\ell)$ (which represents the firm's output) as follows:

(2) Valuated Productivity = $sg(\ell)$

(2) is indeed the customary specification of Valuated Productivity in all the implicit contract models surveyed in this paper. Under identical information (symmetric information) shared by both employer and employee, maximization of the expected profits of the employer subject to a guaranteed level of utility to the employee leads to the following two first order marginal conditions (see for example Green and Kahn).

(3) $U_r(r(s),\ell(s)) = \text{constant}$ (Borch's condition for optimal risk sharing when one party is risk neutral)

(4) $sg'(\ell(s)) = -\dfrac{U_\ell(r(s),\ell(s))}{U_r(r(s),\ell(s))}$ (the condition for ex post efficiency)

where: $r(s) = w(s)\ell(s)$ is the income at state s, U is the utility function, and U_ℓ, and U_r are its labor and income derivatives respectively. This is a system of two equations in two variables w, and ℓ, both depending parametrically on s, the state of nature. Consequently the wage rigidity which holds if $\ell(s)$ is not a contineous variable disappears.

Condition (3) states that when one party is risk neutral the marginal utility of income of the risk averse party should be the same in all the states of nature. Condition (4) states that for any state of nature there exists expost productive efficiency in that the marginal valuated product of labor equals the marginal rate of substitution of income (goods) to leisure in the employee's utility function.

Expost inefficiency occurs when equation (4) is not satisfied as an equality. Expost inefficiency is termed <u>overemployment</u> if the right hand side

of (4) exceeds the left hand side (it is termed overemployment since the joint welfare of the match employer-employee can be expost improved if the employee will actualy work less). It is termed underemployment if the left hand side of (4) exceeds the right hand side (in which case the joint welfare will increase expost by increasing the work load of the employee). Note, however, that underemployment is not tantamount to involuntary unemployment (as defined in the introduction), nor does it imply it.

(2) Asymmetric Information with Employer's Risk Neutrality

Some recent papers on implicit contracts characterize the optimal contract when information is asymmetric. Only employers are assumed to observe the realization of the state of nature. Obviously this assumption leads to a possible moral hazard in that the firm can exploit its informational advantage in a state dependent contract by lying about the true realization. In this case, so goes the story, the optimal contract (which may induce cheating) should give way to a self enforcing truth telling contract.

Calvo and Phelps (1977) and Hall and Lilien (1979) suggest the following solution to the asymmetric information. They argue that while the state of nature is not observed by the employees the level of employment is. Employment, then, is a common knowledge and a contract which maps the level of employment to wage is thus a truth telling contract. Hall and Lilien show that if the employee's utility (actually they consider a union which acts as a single decision making unit for its members, and the utility described is that of the union) is of the following form:

$$(5) \quad U = r - h(\ell)$$

where r is income, ℓ is labor and h is convex increasing function and if the valuated productivity is characterized by (2) the optimal employment contingent and thus truth telling contract will be of the general form:

(6) $r(\ell) = h(\ell) - \text{constant}$

This contract is efficient in the sense described under equation (4). Green and Kahn (1980) show that any concave increasing transformation of (5) will lead to the same contract (6). Note, however, that for a given level of employment, ℓ, and the income transfer to workers conditional on this level of employment, $r(\ell)$, we can compute the implied wage from the definition $r(\ell) = w(\ell)\ell$. From this definition and equation (6) we get by differentiation:

$$(7)\quad \frac{\partial w}{\partial \ell} = \frac{h'(\ell)\ell - (h(\ell)+\text{constant})}{\ell^2}$$

Since $h(\ell)$ is convex increasing function, (7) implies that there exists some $\ell^* > 0$ such that $\frac{\partial W}{\partial \ell} < 0$ for $\ell < \ell^*$ and $\frac{\partial W}{\partial \ell} > 0$ for $\ell > \ell^*$ (with equality on ℓ^*). Thus w has a U shape in ℓ for the optimal contract (6).

Typically the only employment contingent wage agreed upon in real world's explicit contracts is that of overtime pay which relates strictly to the amount of labor supplied by an individual employee. Athough it may be related to the overall level of the firm's employment it does not have to. Indeed, the overall level of the firm's employment may go up, yet the portion of overtime pay may go down by an increase in the number of employees. However even if there exists a positive correlation between the percentage of overtime work and the firm's level of employment, and we are willing to attribute the observed practice of overtime pay to the implicit contractual arrangement we should also expect to observe an <u>increase in wage</u> when the level of the firm's employment is really low and drops further as is implied by the U shape of $w(\ell)$. Surely this is not the case for wage earners in the business world.

The more important point is that this contract model does not permit involuntary layoffs. Firstly, (6) implies that the marginal compensation of a worker equals his marginal value of time (ex post efficiency). Secondly, the utility level of the union in this model is constant for any choice of ℓ by the firm (substitute (6) in (5) to derive this conclusion). Hall and Lilien do not consider the issue of the distribution of the actual amount of labor used by the firm (at any state) among the union's members, but an Akerlof-Miyazaki type argument suggests that if (5) is the utility function of a typical employee, then the convexity of $h(\ell)$, implies that the firm maximizes its expected profits subject to guaranteeing the reservation expected utility to each employee when all employees are working the same amount of time. Thus no layoffs will be observed unless discontinuity of supply (or demand) of labor is introduced.

The utility function in (5) implies a zero income elasticity of leisure which is a very restrictive assumption. Let us then consider a more general concave utility function where both arguments, income and leisure are normal goods. Let's retain the assumption that employers are risk neutral and the assumption of asymmetric information. Green and Kahn (1981) show that the incentive compatibility (i.e. truth telling) constraint is effective for this general case. Moreover the incentive compatible optimal contract will never generate underemployment, rather overemployment, in some states of nature, is the rule (see the definitions of underemployment and overemployment in the discussion that follows equation (4)). So not only involuntary unemployment in this contractual model is ruled out, even underemployment is, leaving us embarassingly with only overemployment at some states.

(3) Asymmetric Information with Employer's Risk Aversion

The optimal contract is characterized by having some states of ex post inefficiency with underemployment if in addition to the asymmetric information, it is assumed that the employers as well as the employees are risk averse (Azariadis (1979), Grossman and Hart (1980)). Grossman and Hart assume that an employer has a pool of employees each with a unit labor supplied discontinuously in an all or nothing fashion. The unit labor has a known alternative value (opportunity cost) in its home use. Incentive compatibility which is an effective constraint in this setup requires the wage to be contingent on the commonly observed level of the firm's employment (rather than the state of nature which is not observed by employees). Thus, to reduce wage the firm has to reduce employment. Grossman and Hart show that when the firm is risk averse it maximizes its utility (subject to the incentive compatibility constraint and the guaranteed level of expected utility per employee) by offering a contract $w(\ell)$ such that the valuated productivity of a unit labor (at the margin) exceeds its opportunity cost (in its home use) in states of unemployment and thus some of the unemployment constitutes indeed underemployment in that ex post the employer-employee match can be made better off by employing some of the unemployed. However the unemployment in this model is not involuntary since the unemployed are entertaining an identical utility level as those employed. Indeed, equalizing the utility levels of those employed and those laid off generates the highest expected utility to the firm given the constraints under which maximization is taken (again the point which was made earlier by Akerlof and Miyazaki).

The novelty of this model is thus the following: When the parties are subject to asymmetric information, when the employer is risk averse and when there is a positive opportunity cost of the employee's time, some of the

observed unemployment constitutes underemployment. This model like its predecessors does not explain the empirical existence of involuntary unemployment. It also implies that wages go down with the level of employment contrary to the empirical evidence of wage rigidity.

(4) Interfirm Coinsurance (rather than employer-employee coinsurance)

A recent implicit contract model that generates genuine involuntary unemployment is that of Chari (1980). In this model the employees have a utility function which depends only on income (leisure is not an argument). The firms are subject to uncorrelated (among firms) random disturbances. The problem of the approach towards risk by the employers is circumvented by assuming zero profits earned by the firm. All of the random proceeds (by the firm) are paid its employees. Given that the employee's utility is concave, the firms (i.e. the collections of employees) can benefit from a lateral risk sharing. Each firm, however, knows only the realization of its own disturbance (and not those realized by the other firms). Thus the transfers among firms (which is specified by the social contract) cannot depend directly on the unobserved firm specific disturbance, which, in view of the asymmetric information, can induce cheating about the true realization. The transfers must be made contingent on a phenomena which is commonly observed (by all firms) and related to the realized state of nature in a way which induces truth telling. Chari suggests that severance of work relation (i.e. layoffs) is commonly observed. By laying off some, or all, of its labor force the firm signals its economic distress to the rest of the world and this signal is observed by all. Under these assumptions Chari shows that the incentive compatible (i.e. truth telling) optimal contract specifies that employees which are randomly chosen to be laid off, entertain a level of utility which

is lower than the utility level of those randomly chosen to retain their jobs (at the same firm). This utility disadvantage requires the unemployment compensation to be lower than the wage paid the working employees. Incentive compatibility requires that the suffering of the laid off should be visible as Chari writes "After the realization of the productivity shock, a randomly chosen number of workers are separated from the firm in the sense that institutional arrangements are set up to prevent them from sharing risk with those remaining in the firm". Chari's model generates then, an optimal social contract characterized by having a genuine involuntary unemployment at some bad states. Moreover it implies that unemployment compensation should be administered socially by a separate (from the firms) central authority. These two implications are indeed an empirical reality.

However Chari's optimal social contract also implies that the level of transfer (per employee) is jointly determined with the percentage of employees laid off and that both are administered by the central authority. Thus, when the firm faces a bad state it has no freedom to choose the number of laid off employees who can then collect their unemployment compensation. This implication is at odds with empirical evidence that the firm has the freedom to decide on the number of laid off employees. Moreover, if firms differ in terms of the probability distribution which affects their cash flow, the mapping of the transfer payments (to laidoff employees) to the percentage employees laid off is firm specific. In reality, unemployment compensation (per employee) is related only to the employee's wage and not in any way to the number of employees laid off by his firm, and this relationship is not firm specific.

History tells us that involuntary unemployment in the form of layoffs preceded the establishment of the institution of social unemployment compensation. Indeed, the first unemployment compensation law in the U.S. was enacted in Wisconsin in 1932 because of the persistently long layoffs during the depression. In Chari's model layoffs with less than complete compensation is needed solely for the provision of a truth telling signal which triggers the social insurance mechanism. What then caused layoffs (without compensation) before social unemployment compensation became the rule. Is it reasonable to assume that the cause for laying off employees has changed since 1930?

Society has existing institutions which monitor firms. The most important is the internal revenue service, others are the social security service and some regulatory agencies. These institutions can also monitor and verify the honesty of compensation claims by firms virtually with no added cost. Can it really be socially more efficient to layoff employees rather then to monitor firms for their truth telling (with the existing monitoring agencies).

(5) Implicit Contract and the Positive Association of Employment and Pure Inflation

Hershell Grossman (1981) adresses the stylized fact that the firm's level of employment is positively related to the price realized by the firm's product even when this price changes in exact proportion to the consumer price index. The macroeconomic manifestation of this stylized fact is the positive association of aggregate employment level and the consumer price index (even when price ratios are unaltered). This 'finding' is not consistent with economic theory if all economic agents have full information, since economic

theory implies that the level of employment is determined by real wage which (by the stylized fact) did not change. The apparent inconsistancy is attributed by Grossman to imperfect information, since (as he suggests) the consumer price index is revealed only after the price of the firm's product is realized and the agreed upon wage is payed for the agreed upon level of employment. Grossman proceeds to show that under this regime of incomplete information classical theory's spot market solutions will generate the aforementioned stylized fact only for a restricted family of employee's utility functions (or restricted range of price changes). He shows that if the utility function is such that the income effect of the choice of leisure is strong relative to its effect on the choice of goods, then, contrary to the stylized fact, an increased firm's price may lead to a decreased level of employment as the equilibrium solution in spot labor markets (which is basically the well known argument for a backward bending supply of labor). Grossman concludes that the classical theory of spot labor markets will produce uniformally the observed positive relationship of the firm's employment level and its product's price only if the family of admissible employees' utility functions is severely restricted. This, he claims, is not plausible thus requiring an alternative theory.

His solution, to the apparent inconsistancy (of classical theory and the stylized fact), is an implicit contract model with symetric (identical) information shared by the employer and the employees. He allows both parties to be risk averse and assumes that the employees' utility is continuous in leisure and income. Both parties, however, observe the consumer price index only after they transfer the agreed upon labor for the agreed upon payment (in each state of nature).

In this framework Grossman proves the following theorem: If the implicit contract solution is such that the nominal wage is constant across states of nature (of realized firm's price) then the employment level is always higher when the realized price by the firm's product is higher. This theorem is correct and it implies uniformly the stylized fact it was set to explain.

It hinges, though, on the assumption that the optimal implicit contract is characterized by an invariant nominal wage. As was demonstrated earlier (see equations (3) and (4)) obtaining a state invariant nominal wage requires a severe restriction on the employee's utility function (or on both utility functions and their relation to each other if the employer is also risk averse). This restriction may be far more severe in terms of its economic plausibility then the restriction imposed on the utility function required to generate uniformly the stylized fact in the classical spot labor market model. To illustrate this point consider the case where: (a) there is no consumer price uncertainty, (b) the employer is risk neutral and (c) the employee's utility function is of the form $U(r,\ell) = V(r) - h(\ell)$ where $V(r)$ is a concave increasing function and $h(\ell)$ is a convex increasing function, (this family of utility functions is indeed analyzed in Grossman's paper). Under these assumptions equation (3) and (4) are the first order conditions for an optimal contract. Substituting $r = w\ell$ in equation (3) and differentiating (3) with respect to ℓ, leads to the conclusion that if the optimal amount of labor varies with the state of nature and the optimal wage does not then $U_{rr} = V_{rr} = 0$ and $V(r)$ must be a linear function, in which case the insurance

motive disappears, the wage does not have to be invariant and there is no need for an implicit contract.

III A Critical Look into the Behavioral Assumptions of the Implicit Contract Model

(1) Implicit Contracts and Time

The implicit contract theory discussed in this paper deals with an atemporal gamble in which employers and employees contract (implicitly) to share the random consequence of a joint activity (production). Once a match (employer-employee) is established it is binding for all possible realizations of the variable state of nature.

Yet, the events in the labor market are not timeless. Therefore the implicit contract theory must be properly embedded in time. An obvious extension is to view the labor match as a sequence of contracts encompassing equal intervals of time (Holmstrom 1980). This intertemporal perspective, however, is sufficient to wipe out the necessity of imposing incentive compatible constraints. It also weakens drastically the strength of the economic argument for assuming risk aversion by employees.

(1a) Incentive Compatibility

In a nonrepeatable gamble with a binding match for all states of nature, the contract must be incentive compatible to prevent the informationally superior side (the firm) from cheating. However, a labor contract is sequentially repetitious and the match is not sequentially binding since employees can quit and change employers over time. The employee's decision regarding quitting is not governed by ethical issues of whether they were lied to by their employers or not, but rather by whether they can do better elsewhere. This assessment is based on the actual wage histories in their own

firm and elsewhere (This wage history is termed by Holmstrom - the firm's reputation). They may choose to hold on to the current match even if they know with certainty that their employers lie to them (about the true realization of the state of nature). Indeed they will stay if their own wage history compared with wage histories in other firms imply that they can do better by staying. On the other hand, competition in the labor market and the resultant threat of possible quitting of employees may lead to a self policing truth telling contract offered by the employers to assure their survival in equilibrium. If this is so, imposing the incentive compatible constraint will only reduce the welfare of employees in equilibrium in which the firm's expected profit is zero. It may be argued that mobility is not perfect and consequently incentive compatibility constrains are necessary. If this is indeed true we shall then have a very tough time explaining the concurrently imposed constraint of guaranteeing a reservation level of expected utility (to the employee) on the force of the economic argument that otherwise the employees won't be retained (Azariadis (1979)).

Recall that the incentive compatibility constraints are necessary to generate underemployment when both parties are risk averse. Consequently sequentially repeatable contracts rule out such underemployment.

(1b) Risk aversion of employees. Given that a contract is sequentially repeatable the employee can smooth the consumption path by a sequence of savings and dissavings. Indeed he does not have to set aside a special fund for this buffering purpose as he can use the savings which are accumulated for bequest or for investment purposes, or those that are accumulated in anticipation of a purchase of a durable. Also many consumption goods are consumed at discreet points rather than continuously. An example is a vacation in the islands. If leisure is intertemporalally substitutable (Lucas

and Rapping (1969), Kydland and Prescott (1980)), it is reasonable to conclude that adjusting the choice of the points where the discrete consumption is entertained will not alter significantly the lifetime utility. It can likewise be claimed that minor readjustments of the discreet points in time where durables are purchased will not alter significantly the lifetime utility. Finally borrowing from banks are at least partially obtainable even if not to the full extent of the available human capital of the employee. This is true at least for middle class employees.

The preceding arguments imply that the employee is indifferent between alternative (two dimensional) distribution functions of wage and labor (each arising from corresponding one period implicit contracts) if they have the same expected wages and the same expected time worked and if the contracts are sequentially repeatable under exactly the same conditions each time (Feldstein 1976).

Consequently the employer in maximizing his expected profits has to satisfy the reservation utility level (of the employee) by choosing an expected wage and an expected time worked (Burdett and Mortensen (1980)) rather than satisfying the reservation expected utility of wage and time worked. The insurance motive which is crucial in a nonrepeatale gamble therefore disappears. Thus wage is indeterminate in repeatable implicit contract models, in particular it is not necessarily rigid. Only the expected wage is uniquely determined.

It can be shown, though, that if the set up cost of changing a wage from any given level to any other level is positive (no matter how small it is), the wage indeterminacy will vanish in favor of a fixed wage such that the reservation expected utility is satisfied (but this has nothing to do with risk aversion and insurance).

(2) Disagreement on What is the True Distribution

In all the variants of the implicit contract model that we considered it was assumed that both parties agree on the exact probability distribution of the relevant random variables. But why should they, if inference is not strictly deduced from past realizations of the relevant variables by themselves, but also on the basis of some personal understanding of the functioning of the economy. Indeed it is hard to find two economists that will agree on predictions of future events even if they have identical data sources. Clearly the two parties to the contract may disagree. Such a disagreement wipes out the most important result of rigid wages obtained in some of the implicit contract models when employers are risk neutral. In such contract models wage will be higher in states considered by the employee more likely but are considered less likely in the eyes of the employer (see appendix).

(3) Maximizing Expected Profit Subject to an Unknown Constraint

The behavioral assumption in the implicit contract theory is that the firm maximizes its expected utility of profits subject to guaranteeing a reservation expected utility for its employees and subject to incentive compatibility (i.e., truth telling) constraints. The implicit contract is the solution to this maximizing problem.

If the employer is risk neutral, the employee's concave utility depends only on income, and the marginal productivity of labor is positive for any state of nature and any amount of labor used ,no further information is needed to derive the conclusion that the contract is characterized by a state invariant wage (and also a state invariant employment such that each employee supplies all the labor he has to offer). In particular the firm does not need the exact specification of the employee's utility. Competition in the labor market will lead all the firms to the 'right' rigid value. However if leisure

is an argument in the utility function or if both parties are risk averse, the contract is a schedule $w(\ell)$, relating wage to employment level, a relationship which is firm specific. Obviously this schedule requires a complete knowledge of the utility functions of both parties for it to be attained as a solution for a maximization problem.

It is reasonable to assume that the employer knows his own utility function as it constitutes a formal manifestation of his own tastes. But how can he tell the employee's utility function unless a mechanism is designed to elicit this information, which is surely not the case in reality. Are employers trying or even willing to get this information indirectly in someway? Consider the more specialized form of a labor contract, with symmetric information, a risk neutral employer and an all or nothing supply of unit labor (by each employee). In this case the implicit contract theory implies that lay off will occur only if the state of nature is sufficiently bad so that the valuated productivity of the marginal unit of labor falls below the opportunity cost of the unit labor of a typical employee before all members of the firm's pool of employees are put to work. The opportunity cost of the unit labor is a parameter that can be estimated. Yet executives in charge of manpower do not estimate it because they do not use it in their decisions regarding layoffs (I challenge anyone who disagrees, to provide a real world counter example). Their decisions on layoffs depend on the implied costs and benefits to the firm. The reduced labor cost, in bad days constitutes the benefit (of layoffs) whereas losing part of the firm's manpower to <u>competitors</u> with a consequent increase in the cost of hiring, training and deffered revenues in good days being the cost.

Can we suggest that competition among firms leads to a labor market solution which satisfies the rules implied by the implicit contract models in

spite of the fact that manpower managers do not elicit information on employees' utility functions, or worse yet, are not looking for it. Were it so we could have claimed, in the grand tradition of economic theory, that labor markets operate 'as if' an implicit contract is designed regardless of the plausibility of the model's assumptions. However such a claim is logically acceptable only if the empirical implications of the model would have been consistent with the stylized facts. Unfortunately they are not as was demonstrated in the previous section.

Concluding Remarks

Some of the observed regularities in the labor markets are implied by the alternative versions of the implicit contract theory. Yet all the versions are also characterized by implied behavior which goes against the empirical evidence. We cannot applaud the theory on the basis of its successful implications if these "successes" are jointly obtained with implications which reality refutes. Thus even if we do not question the assumptions made, the implicit contract theory model fails to be a reasonable explanation of the real world. However, there are also compelling reasons rooted in economic common sense that shroud in doubts most of the crucial assumptions made. The implicit contract theory, therefore, cannot serve as a model that describes observed behavior in labor markets.

On the other hand the ideas developed in these models may serve as instruments to be used in labor bargaining by more sophisticated future bargainers, who will actually engage in a scientific method of identifying, characterization of the relevant behavioral relations and collecting the relevant data, to arrive at mutually optimal bilateral solutions. Meanwhile we can only admire the internal beauty of these models.

Footnote

[1]Note that the linearity of V(r) is only a necessary not a sufficient condition for a rigid wage. Indeed the linearity of the employee's utility in income eliminates his desire for insurance. Consequently, given the optimal labor schedule $\ell^*(s)$, and the optimal rigid wage w^*, any other wage schedule $w(s)$ such that $Ew(s)\ell^*(s) = w^*E\ell^*(s)$ (where E is the expectation operator) will yield the same expected profit for the employer and the same expected utility to the employee. Another behavioral assumption is then necessary to explain rigid wage.

Appendix

When the risk neutral employer and the employee, whose concave utility depends on income alone, have two distinct distributions (of the relevant state of nature), but the realization of the state of nature is verifiable by both, the implicit contract is the solution to the following problem:

(A1) $\text{Max} \sum_i q_1^i (s^i g(\ell^i) - w^i \ell^i)$ (The firm's expected profit)

Subject to:

(A2) $\sum_i q_2^i U(\ell^i w^i) = R$ (The expected utility according to the employee's distribution should equal his reservation level)

(A3) $\ell_i \leq 1$ for all i (in each state no more then the available labor can be used)

Where q_1^i and q_2^i are the probability in state i as viewed by the employer and the employee respectively.

Setting the Lagrangian of the problem and differentiating we get the following first order conditions:

(A4) $\frac{\partial}{\partial \ell_i} : q_1^i (s^i g'(\ell^i) - w^i) - \lambda q_2^i U'(\cdot) w^i - \mu_i \leq 0$

(A5) $\frac{\partial}{\partial w_i} : -\ell^i [q_1^i + \lambda U'(\cdot) q_2^i] \leq 0$

(A6) $\frac{\partial}{\partial u_i} : \ell_i - 1 \leq 0$

Where λ and μ are the Lagrangian multipliers of (A2) and (A3) respectively.

From (A2) there must exist a state j such $\ell_j > 0$ and $w_j > 0$.

For this state (A5) implies:

$$(A7) \quad \lambda = -\frac{q_1^j}{q_2^j} \cdot \frac{1}{U'(\ell^j w^j)} < 0$$

Substituting (A7) in (A4) yields:

$$(A8) \quad s^i g'(\ell^i) - \mu_i = 0$$

The condition $s^i g'(\ell^i) > 0$ for all s^i and ℓ^i implies $\mu_i > 0$ for all i.

(A6), then, implies: $\ell_i = 1$ for all i. Note that this is true for the particular case $q_1^i = q_2^i$ for all i. (This result is reported in Polemarchacis (1980)). Returning to (A5), substituting $\ell_i = 1$ and rearranging we get:

$$(A9) \quad U'(w^i) \leq \frac{1}{|\lambda|} \frac{q_1^i}{q_2^i}$$

with strict equality for all i such that $w^i > 0$. Since $U'(w)$ is a decreasing function, w^i is decreasing in $\frac{q_1^i}{q_2^i}$ and may become zero for all i such that $\frac{q_1^i}{q_2^i} > K$ provided $U'(0) \leq \frac{1}{|\lambda|} K$.

We conclude that the wage will be lower in states for which the employer assigns a higher probability and the employee assigns a lower probability. Indeed it is possible that the parties agree to a high wage payed in states believed to be more likely by the employee (and believed to be less likely by the employer) and zero wage payed in states with a reversed ranking.

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